Fisheries & Wildlife Management Division

RESOURCE STATUS AND ASSESSMENT BRANCH

Western Blue Flag (*Iris missouriensis*) in Alberta: a census of naturally occurring populations for 2000

Alberta Species at Risk Report No. 18

Alberta
SUSTAINABLE RESOURCE DEVELOPMENT

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Reg Ernst

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Executive Summary

In Canada, all of the known naturally occurring populations of western blue flag *(Iris missouriensis)* occur in the Cardston area of southwestern Alberta, within 10 km of the United States border. Prior to this project, six sites of naturally occurring western blue flag were confirmed in Alberta (Gould, 1999). As a result of investigations carried out in 2000, it is believed that only four of the six remain. Two new sites were discovered near previously known locations. Inventories conducted at all sites in 2000 revealed a total of 8705 stems. Information is inadequate to determine population trends at most sites; however, western blue flag appears to be declining at a site in Police Outpost Provincial Park. Recommendations at this site include reintroduction of grazing or manual control of competing vegetation. At other sites recommendations emphasize grazing regimes to benefit western blue flag. Range management plans will be completed for all western blue flag sites. A management team involving landowners and stakeholders will be initiated to develop a long-term management plan. Efforts should continue to develop cooperative relations with landowners to provide long-term sustainability of western blue flag in Canada.

Acknowledgments

I would like to thank the landowners for allowing me access to their land to inventory and search for populations of western blue flag. As well, I would like to thank Darcy Brown (Conservation Officer, Cardston District) for his cooperation with the inventory at Police Outpost Provincial Park.

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1.0 Introduction

On April 1, 2000, the Alberta government initiated a regional species at risk program. The major objectives of the program are to determine the current status of targeted "species at risk" in Alberta, make recommendations to manage these species, and secure habitat in efforts to maintain or enhance current population levels. Many of the "species at risk" occur on private lands; therefore, a major component of the program is to develop agreements with landowners to ensure the long-term survival of targeted species.

The only plant species included in the 2000 program was western blue flag (*Iris missouriensis)*. Western blue flag is a long - lived perennial, occurring at the extreme northern limit of its range in southwestern Alberta. The Alberta Natural Heritage Information Centre (ANHIC) lists western blue flag as an S1/G5, meaning that the plant is secure on a global basis but there are five or fewer occurrences in Alberta. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has designated western blue flag as a threatened species (Gould 1999).

The objectives of this project were:

- to locate and inventory all known populations of naturally occurring western blue flag in Alberta
- to assess habitat conditions
- to identify potential threats
- to develop management recommendations for all western blue flag sites
- to request landowner support for long term conservation agreements.

2.0 Methods

A literature review was conducted to identify historic western blue flag sites. Landowners were contacted for each site listed in Wallis and Bradley (1989) and permission was granted to carry out the inventory on their property.

At Police Outpost Provincial Park (POPP) permanent transects of 11 m (POPP West) and 14 m (POPP East) were set up at both sites as well as photo points. Daubenmire frames were read for per cent cover values at 3 m intervals along the permanent transects and sketches were made for both sites. At other sites, per cent cover values were recorded for species within clumps[1] and within a 30 cm buffer around the clump perimeter (hereafter referred to as the clump method). The values were determined by viewing the western blue flag clump from above to estimate per cent canopy cover for each vegetation category (graminoids, western blue flag, forbs, and shrubs). Species associated with western blue flag were also recorded.

Area was measured at sites with a definitive boundary around western blue flag (POPP East, POPP West, and Whiskey Gap). Measuring the area of the other sites was impractical because of the existence of numerous clumps of western blue flag.

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[1] For the purposes of this report, a clump is a discrete group of plants within a specified area (1 m^2 or less)

Consequently, permanent transects would have been an inappropriate technique to use at these sites for long-term monitoring of western blue flag.

The inventory was conducted by marking each clump and outlying individual plants with survey ribbon. Plant height was recorded. Each stem was then counted, flowering stems were noted separately and where possible stems were classified as either mature or juvenile.

All western blue flag sites were marked on air photos. Photographs were taken to note gross habitat features and GPS (geographical positioning system) positions were recorded for all sites.

3.0 Site Summary

3.1. General

3.1.1. Study Area

Most known populations of naturally occurring western blue flag in Canada are located within ten kilometers of the United States border near Cardston (Figure 1). Sites inspected were those identified in previous studies and reports (Wallis and Bradley 1989, Cornish 1998, and Gould 1999).

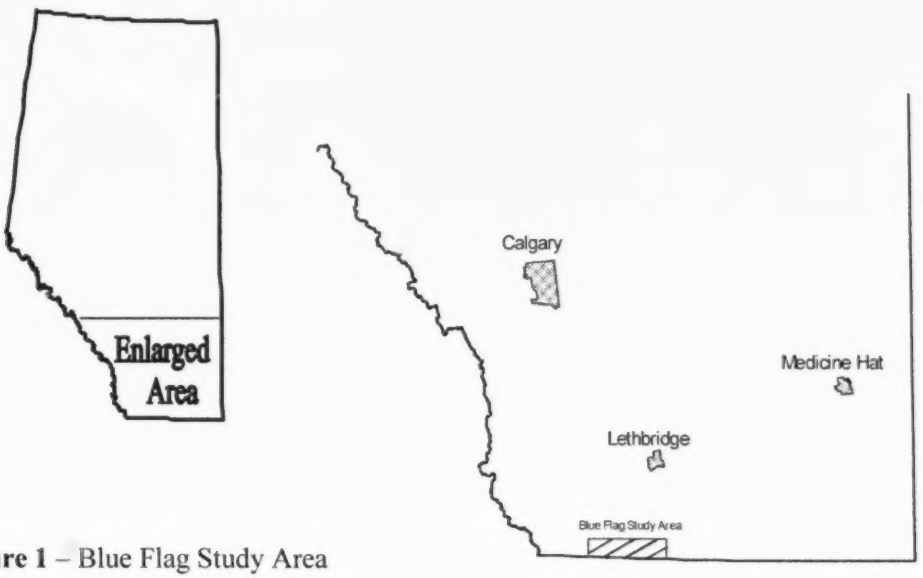

Figure 1 – Blue Flag Study Area

3.1.2. Results

Wallis and Bradley (1989) list six populations of western blue flag. All of these sites were investigated. Two of the populations (Mary Lake and one near Carway) are presumed to no longer occur because a diligent search of these sites failed to reveal any western blue flag. Wallis and Bradley had not inspected these two sites in 1989, but rather site information was conveyed to them by local resident and biologist George

Scotter. At the site near Carway, the landowner had no knowledge of any western blue flag on his property in spite of having ranched it for many decades. The Mary Lake property has changed ownership since the 1989 report and the new owner has no knowledge of any western blue flag at this site. Populations of western blue flag were confirmed at the other sites.

Two new sites were discovered and inventoried in 2000. One occurs about 200 m away from the original population at Police Outpost Provincial Park and the other is on a property about four km south of previously inventoried populations.

Table 1 summarizes numbers of stems and flowering stalks for each site and each sample period. While information is inadequate to determine trends at most sites, a decrease in the POPP West population is evident.

Table 1: A comparison of stem counts and flowering stalks for 1989, 1998, and 2000.

Site	Date	Total Stems	Flowering Stalks
POPP West	1989	650	6
	1998	325	1
	2000	219	14
POPP East	1989	n/a	n/a
	1998	n/a	n/a
	2000	175	14
Beazer	1989	1500	several hundred
	1998	n/a	n/a
	2000	2091	304
Carway	1989	5000	high proportion
	1998	n/a	n/a
	2000	6049	256
Whiskey Gap	1989	203	0
	1998	111	2
	2000	171	2

n/a: site not inventoried

3.1.3. Discussion

In general, western blue flag occurs in the transition zone between riparian and upland areas; however, during the 2000 inventory there were exceptions noted. Western blue flag was observed growing in relatively dry upland communities as well as growing in the understory of willow (*Salix spp.)* communities. Due to these variations in microhabitat, it is difficult to make generalizations regarding the habitat niche of this species. However, western blue flag does appear to be associated with areas of high soil moisture in the spring and dry conditions later in the summer. In 2000, there was no visible surface water near any of the western blue flag populations except at POPP.

Grazing seems to be an important factor in maintaining viable western blue flag populations. While no western blue flag plants were found on heavily grazed areas, the healthiest populations were on lightly grazed areas. Fall and winter grazing may provide the greatest benefit to the plants. This was the grazing regime used at the Carway site, which had the largest population of western blue flag. Some level of grazing is beneficial to western blue flag because grazing removes competitive species. Eckert et al. (1973) state that western blue flag is an increaser species under light to moderate grazing regimes. Litter build-up as well as competition from other plants may be excessive and detrimental to western blue flag under very light or no grazing conditions.

3.2. POPP West

3.2.1. Study Area

This is a very small site (about 30 m^2) with a slight northerly aspect located near Police Lake. Most of the western blue flag stems are located within one metre of an 11 m transect oriented north to south. Most of the competing species are graminoids and willows.

3.2.2. Results

In 2000, the total stem count at POPP West was 219. This compares to 650 and 325 for 1989 and 1998 respectively. In 1989, Wallis reported six flowering stalks and in 1998 Cornish reported one. This compares to 14 in 2000 (Table 2). At this site, only the plants receiving full sunlight produced flower buds. There were no persistent flowering stems from previous years.

Table 2: Stem counts and attributes

Site	Mature	Juvenile	Flowering*	Ratio**	Total	Height in cm
POPP West	199	6	14	1:16	219	35-45
POPP East	131	30	14	1:13	175	35-45
Beazer	1839	153	314	1:7	2091	35-45
Carway	5523	270	256	1:22	6049	35-45
Whiskey Gap	104	65	2	1:85	171	10-20

* Flowering also includes flower buds and fruit pods

** Ratio is the number of flowering stems compared to total stems.

Cover values within three Daubenmire frames (0.10 m^2) were recorded (Table 3). Graminoid cover was about 20% and included smooth brome, sweetgrass (*Hierochloe odorata)*, sedge (*Carex spp.*), hairgrass (*Deschampsia cespitosa*), bluegrass (*Poa spp.*), and northern reed grass (*Calamagrostis inexpanas*). Forb cover was less than 3% and included wild chives (*Allium schoenoprasum)*, dandelion *(Taraxacum officinale)*, star-flowered Solomon's seal (*Smilacina stellata*), silverweed (*Potentilla anserina*), meadow parsnip (*Zizia aptera*), and American vetch (*Vicia americana*). Shrub cover was about 5%, all of it willow.

Table 3: Cover values of graminoids, forbs, and shrubs at western blue flag sites

Site	Graminoid	Blue Flag	Forb	Shrub
POPP West	20%	tr*	<3%	5%
POPP East	20%	tr	15%	tr
Beazer	43%	24%	3%	tr
Carway	35%	35%	20%	tr
Whiskey Gap	50%	5%	5%	20%

* trace amounts due to sparse distribution

3.2.3. Discussion

The POPP sites are the only ones on public lands, therefore, it is important to determine why the stem count at POPP West has decreased. It may be because of the high water table, because of the encroachment of graminoids and willows, because of the very heavy litter build-up, or a combination of these factors. The heavy litter build-up allows for moister conditions to prevail, favouring invasive non-native species such as brome grass. Efforts should be undertaken to mimic light grazing in order to reduce litter accumulations and competing vegetation.

Even in the unusually dry conditions of June 2000, saturated ground occurred within ten metres of some of the western blue flag plants. In 1995 the lake level levels rose substantially and may have flooded out a portion of this population (Darcy Brown pers. comm.). Cornish (1998) noted that a high water table and invasion by smooth brome (*Bromus inermis*) isreducing the density and vigor of western blue flag at this site. In 2000, an extremely heavy litter build-up and encroachment from willows (Appendix A - Photo 1) was observed. These factors may be the cause of the western blue flag population decline at POPP West.

3.2.4. Management

This site should be treated to reduce competing vegetation, litter, and willows. Volunteers could be used to remove the litter, some of the competing graminoids, and the competing willows. An alternative would be to implement a prescription grazing plan for this site.

Although the sites occupied by western blue flag are small (< 200 m^2 total), the adjacent meadows occupied by smooth brome are larger (> 1000 m^2) and appear to be expanding. Some success controlling smooth brome has been reported using a combination of burning and grazing (Dean Nerberg, pers. comm.). At this site, some form of rest/rotation grazing may be appropriate. This could mean light to moderate grazing for two years followed by a year of complete rest. Strict monitoring would be an integral component of any grazing system implemented.

3.3. POPP East

3.3.1. Study Area

There is no reference to this site in any of the previous work done on western blue flag. This site is larger and much drier than the POPP West site. It is located about 200 m east of the POPP West site on a dry SW facing slope on the east side of a willow/balsam poplar (*Populus balsamifera*) grove. All of the western blue flag plants are located well away from any saturated soil and many are located on the drier upland sites in association with rough fescue (*Festuca scabrella*) and shrubby cinquefoil (*Potentilla fruiticosa*) (Appendix A – Photo 2). Two western blue flag clumps are located under willow canopies.

3.3.2. Results

Fewer stems were counted at this site compared to the west site (175 versus 205) but the number of flowering stalks were the same (Table 2). There is no previous data to compare to 2000 data. There are persistent seed pods from previous years. Cover values show graminoids at 20%, forbs at 15%, and just a trace for shrubs. The one to two metre elevational difference at this site resulted in high vegetative diversity containing species found in both mesic habitats and on drier upland sites. Species included (but were not limited to) penstomon (*Penstomon confertus*), camas (*Camassia quamash*), hedysarum (*Hedysarum alpinum)*, bedstraw (*Galium boreale*) sticky purple geranium (*Geranium viscosissimum)*, and goldenrod (*Solidago sp.*).

3.3.3. Discussion

This site was quite dry and 2000 was an exceptionally dry year. This suggests that western blue flag will survive on dry sites as long as early season moisture is present. It is likely that most of the moisture this site receives is from snowmelt and precipitation rather than from Police Lake.

3.3.4. Management

This site should be monitored annually to determine population trends. In particular, the western blue flag clumps under the willow canopies should be monitored to determine what impact the willow overstory may have on the long-term viability of western blue flag.

Smooth brome is a serious invader on this site. Blue grass and Timothy (*Phleum pratense*) are also present. No immediate management action is recommended at this site. If brome continues to increase in area and density, some control action may be required. Natural Resource Service is considering the possibility of having a graduate student investigate the smooth brome problem (Darcy Brown pers. comm.). Grazing could also benefit this site as suggested for the POPP West site.

3.4. Beazer Site

3.4.1. Study Area

This is a large site on a north-facing slope stretching for about 400 m along the south side of an ephemeral drainage. Many of the western blue flag clumps are located on the drier upland sites and appear to be very competitive, even in relatively dense vegetation (Appendix A – Photo 3). Dominant species on this site are non-native grass species, including Kentucky blue grass, brome, timothy, orchard grass (*Dactylis glomerata).* Sedges are also present.

3.4.2. Results

In 1989, Wallis and Bradley estimated there were perhaps 1500 stems at this site; in 2000, we counted 2091 (Table 1). This site had the highest ratio of flowering/fruiting stems. Out of a total of 2091 stems there were 304 either in flower or in pod. (Table 2). Graminoids (43% cover) dominated this site. Western blue flag cover was 24% while forb cover was 3% (Table 3). At one western blue flag clump, buckbrush (*Symphoricarpos sp.*) represented 50% of the cover. Other species present on this site included dandelion, meadow rue (*Thalictrum sp.*), strawberry (*Fragaria virginiana*), shrubby cinquefoil, alsike clover (*Trifolium hybridum)*, paintbrush (*Castilleja spp.*), Canada thistle (*Cirsium arvense*), white camus (*Zigadenus elegans*), sticky purple geranium, hedysarum, wild chives, yarrow (*Achillea millefolium*), meadow parsnip, tall buttercup (*Ranunculus acris*), and goldenrod.

3.4.3. Discussion

This site had the highest vigor as indicated by flowering and seed production. It is second in terms of total stems (2091 versus 6049 at the Carway site). Up until a few years ago, this site was lightly grazed year - round by horses. Cattle now graze it for a few weeks each season starting around the end of July. It is not known how heavy current grazing is, but litter accumulations would indicate that it is light.

3.4.4. Management

Wallis and Bradley (1989) indicated that the dugout constructed near the western edge of this site may have a negative impact on western blue flag but this does not seem to have been the case. The vigor of this site indicates that range management since 1989 has benefited western blue flag. However, on portions of this site, competition from non-native grasses is occurring, indicating that grazing may be somewhat lighter than optimal. The owners of this property should be encouraged to graze this site at the light to moderate level. For the purposes of this report, defining light to moderate grazing level would be removal of no more than 40% of the current season's production.

3.5. Carway Site

3.5.1. Study Area

This site is located about 6 km north of Carway and has the largest known population of western blue flag in Alberta. The main population is situated near the boundary between two quarter sections near the ranch buildings. There is another site of about 500 stems

located about 4 km further south. This location is between a road and a newly constructed dugout (Appendix A – Photo 4).
Habitat for the Carway population varies from bottomlands dominated by sedges and hairgrass to understory in willow thickets to drier upland sites with rough fescue. The majority of western blue flag plants in this population show a strong but non-obligatory association with willows (Appendix A – Photo 5).

3.5.2. Results

Total stem count was 6049 with 256 flowering stems giving a ratio of 1:22 (Table 2). Western blue flag cover averaged 35%, graminoid cover averaged 35%, forb cover averaged 20% and shrub cover was just a trace (Table 3). Of the graminoids, Kentucky blue grass was the most dominant but on some sites sedges and hairgrass made up a large portion of the plant community. Species associated with western blue flag communities are similar to those found at the Beazer site but include more wild chive, sedges, rough fescue, and hairgrass.

3.5.3. Discussion

The landowner indicated that flowering stems were fewer in 2000 than in other years and felt that this was due to the very dry conditions. Litter carryover on most of the Carway site is very high indicating recent grazing has been very light. Although the Carway population appears to be doing very well, the lack of flowering stems may be related to vegetative competition resulting from the light grazing. This site has been fall and winter grazed for at least the past several decades and judging by the large and apparently thriving population of western blue flag it seems to have been very beneficial.

3.5.4. Management

Portions of the Carway population have been hayed periodically over the years. Haying may be a compatible use if mowing is done around the clumps or if the mowing machine is raised as it passes over the western blue flag. This landowner should be encouraged to manage in a similar fashion as in the past but heavy accumulations of litter indicate that slightly increasing the level of grazing may be acceptable. It is estimated that over the last few years, less than 30% of the forage has been removed each grazing season. Removing about 40% of the current year's growth may be more beneficial to western blue flag..

3.6. Whiskey Gap Site

3.6.1. Study Area

This is a very small and apparently unique site of about 40 m^2 located on a southwest - facing slope about 100 m above the Milk River Valley bottom. Moisture for this site is derived solely from snowmelt and rainfall. There are no willows associated with this site but western blue flag occurs along the transition zone between hairgrass and a variety of shrubs including rose, wolf willow (*Elaeagnus commutata*), and shrubby cinquefoil (Appendix A – Photo 6).

The plants located among the shrubs are of normal size but those located in the grassy meadow are severely stunted, mostly around 10 cm tall. Some plant tips have been grazed

but it is unlikely that cattle deliberately select for western blue flag. It is more likely they inadvertently nip western blue flag when grazing the hairgrass. At the Whiskey Gap site, the plants occur as individuals and occasionally in a group of three or four stems.

3.6.2. Results

In 2000, a total of 171 plants were counted at this site, compared to 113 in 1998 (Table 1). Of the 171 plants, 55 had their tips nipped off by grazing and 65 were very small (< 10 cm tall). There were only two flowering stalks, both located among shrubs (Table 2). Cover values on this site were graminoids (mostly hairgrass) 50%, western blue flag 5%, forbs 5%, and shrubs 20%. This is the only site where native grass was the dominant graminoid and where non-native grasses were not a factor.

A unique feature of this site is the presence of prickly milk vetch *(Astragalus kentrophyta)* located within 20 m of the western blue flag plants. This plant is listed as an S1 by ANHIC. It occurs on dry prairies and only at three locations in Alberta, all in the southeastern portion of the province. The nearest known population of prickly milk vetch to the Whiskey Gap site is at Writing on Stone Provincial Park (Moss 1983).

3.6.3. Discussion

Ample carryover and litter indicate light to moderate grazing is occurring at the Whiskey Gap site. The impact on western blue flag may be due to the season of grazing. The landowner indicated that this site receives early spring grazing every year. The cattle likely linger at this site and damage early season growth on the western blue flag.

3.6.4. Management

The landowner should be encouraged to graze this site later in the season (fall/winter may be best) and perhaps rest the site for one or two seasons to determine how much impact grazing is actually having. Environmental conditions at this site are likely sub-optimal for western blue flag.

4.0 Conservation Agreements

The approach of the new program is to promote voluntary cooperation of landowners in management of species at risk. This includes informing residents of management options that may benefit species such as western blue flag, as well as providing opportunities for voluntary participation in species management through conservation agreements. At this time, it is not known how many landowners will agree to the signing of conservation agreements. Future management efforts should concentrate on establishing conservation agreements to ensure the following:

- No developments that would negatively impact western blue flag
- No cultivation
- No alteration of hydrological processes that would negatively impact western blue flag

- Light to moderate grazing regime or seasonal grazing rotations designed to benefit western blue flag (more research is needed to determine optimal level of grazing or best season of use but light to moderate grazing, not exceeding 40% removal of current season's production may be appropriate)

- No use of chemicals or other control practices that would harm western blue flag

- Any haying activity should be designed to minimize impact on western blue flag

5.0 Recommendations

The following measures are recommended to secure the future for western blue flag in Alberta:

- Search for additional populations of western blue flag through review of air photos of the study area and selection of suitable sites based on habitat features and light to moderate grazing management;

- Implement a program to monitor permanently marked clumps to determine changes in density, cover values, flowering success, and clump size. This monitoring needs to be conducted every five years or more frequently at sites subject to changes in range management;

- Conduct a western blue flag census every ten years or more frequently if declining population trends are indicated through the monitoring program;

- Distribute the colour brochure (Alberta Forestry, Lands and Wildlife, 1991) in the study area and request landowners to report any western blue flag plants found on their property;

- Encourage landowners at the Carway and Beazer sites to continue managing as they have in the past;

- Carry out range trials at one of the larger sites to determine the optimal level of grazing that would best encourage the growth and reproduction of western blue flag;

- Communicate with landowners to encourage management practices to benefit western blue flag populations (see 4.0 Conservation Agreements);

- Develop range/vegetation management plans to sustain western blue flag populations in the context of overall ranch management;

- Request landowners to inform Alberta Fish and Wildlife Division of any significant changes in management practices on lands with western blue flag;

- Initiate a western blue flag management team, involving landowners and stakeholder groups to develop a long–term management plan for the species;

- Through a cooperative effort, ensure that long–term management is effective for the species, but also that it does not negatively impact the economics of ranching in western blue flag sites;

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Personal Communications

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Appendix A

Photos of Western Blue Flag Sites

Photo 1: Willow and graminoid encroachment at the POPP west site

Photo 2: Dry upland site at POPP east

Photo 3: A competitive blue flag site at the Beazer site

Photo 4: An atypical blue flag site on the Carway site.

Photo 5: Typical western blue flag habitat at the Carway site.

Photo 6: Unique Whiskey Gap upland site.

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